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Rodeffer

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[54] **HORIZON-TO-HORIZON TVRO ANTENNA MOUNT**

[75] Inventor: **Charles E. Rodeffer**, Burlington, Iowa

[73] Assignee: **Winegard Company**, Burlington, Iowa

[21] Appl. No.: **110,167**

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[51] **Int. Cl.**[6] **H01Q 3/02**; H01Q 1/12; H01Q 3/00

[52] **U.S. Cl.** **343/882**; 343/878; 343/766; 248/232

[58] **Field of Search** 343/882, 880, 878, 883, 343/763, 765, 766; 248/232, 124, 178, 179; H01Q 3/02, 1/12, 3/00

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Primary Examiner—Donald Hajec
Assistant Examiner—Hoanganh Le
Attorney, Agent, or Firm—Dorr, Carson, Sloan & Peterson

[57] **ABSTRACT**

A mounting assembly including a casing having an outer surface attached to a TVRO antenna and having an inner surface and at least one first guide slot positioned on the inner surface of the casing. An inner tube is located inside the casing and has portions which extend out of the casing for attaching to the mounting pole. At least one second guide slot is formed through the inner tube. One of the first or second guide slots is non-linear. The casing is rotated by a spider-like mechanism having drive arm having a first end nested in the first guide slot, a body passing through the second guide slot. A leadscrew passes through the spider like mechanism and a motor coupled to one end of the leadscrew turns the leadscrew causing the spider like mechanism to move vertically along the leadscrew, which in turn causes the casing to rotate with respect to the inner tube.

20 Claims, 3 Drawing Sheets

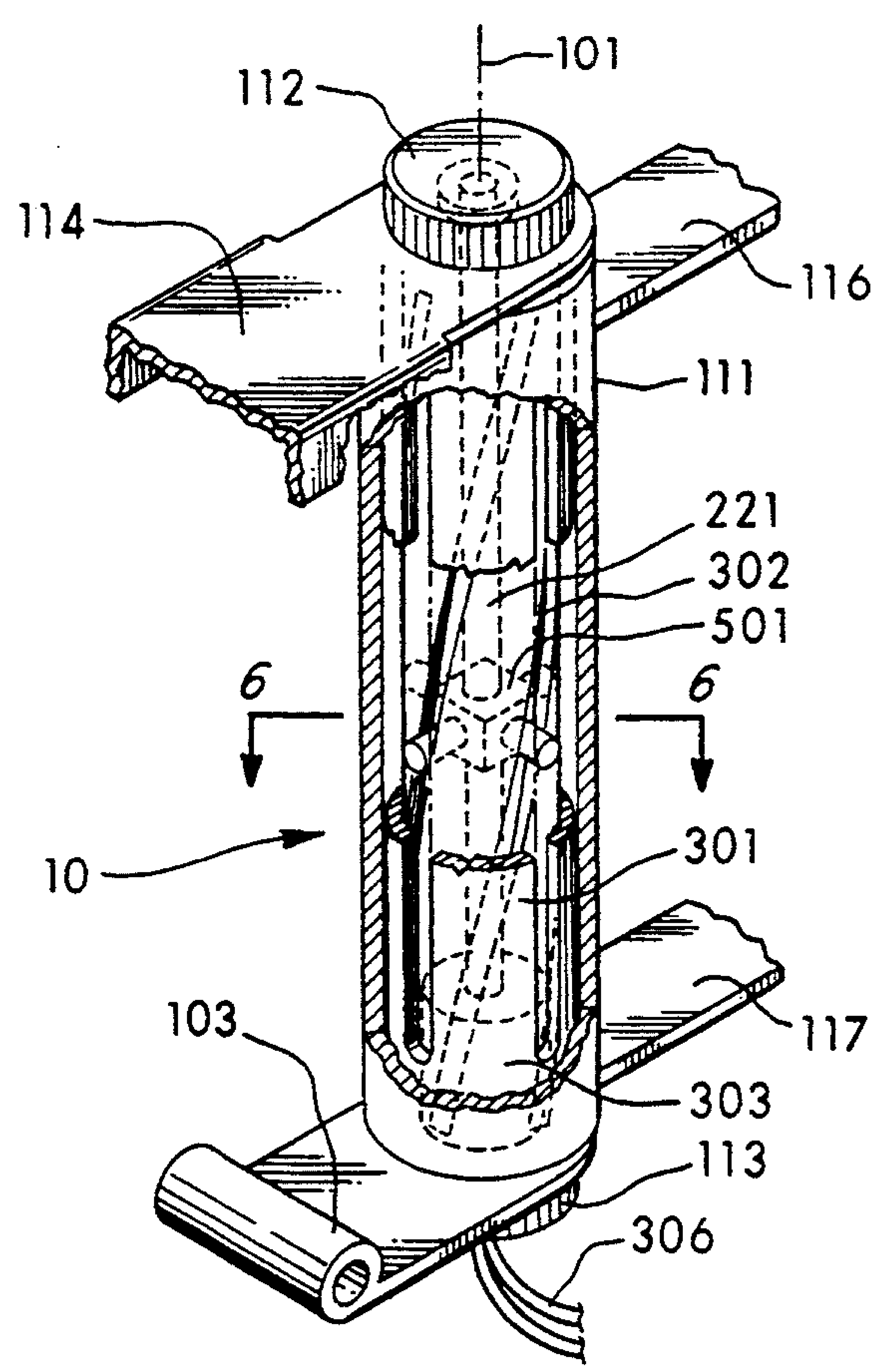


Fig. 1

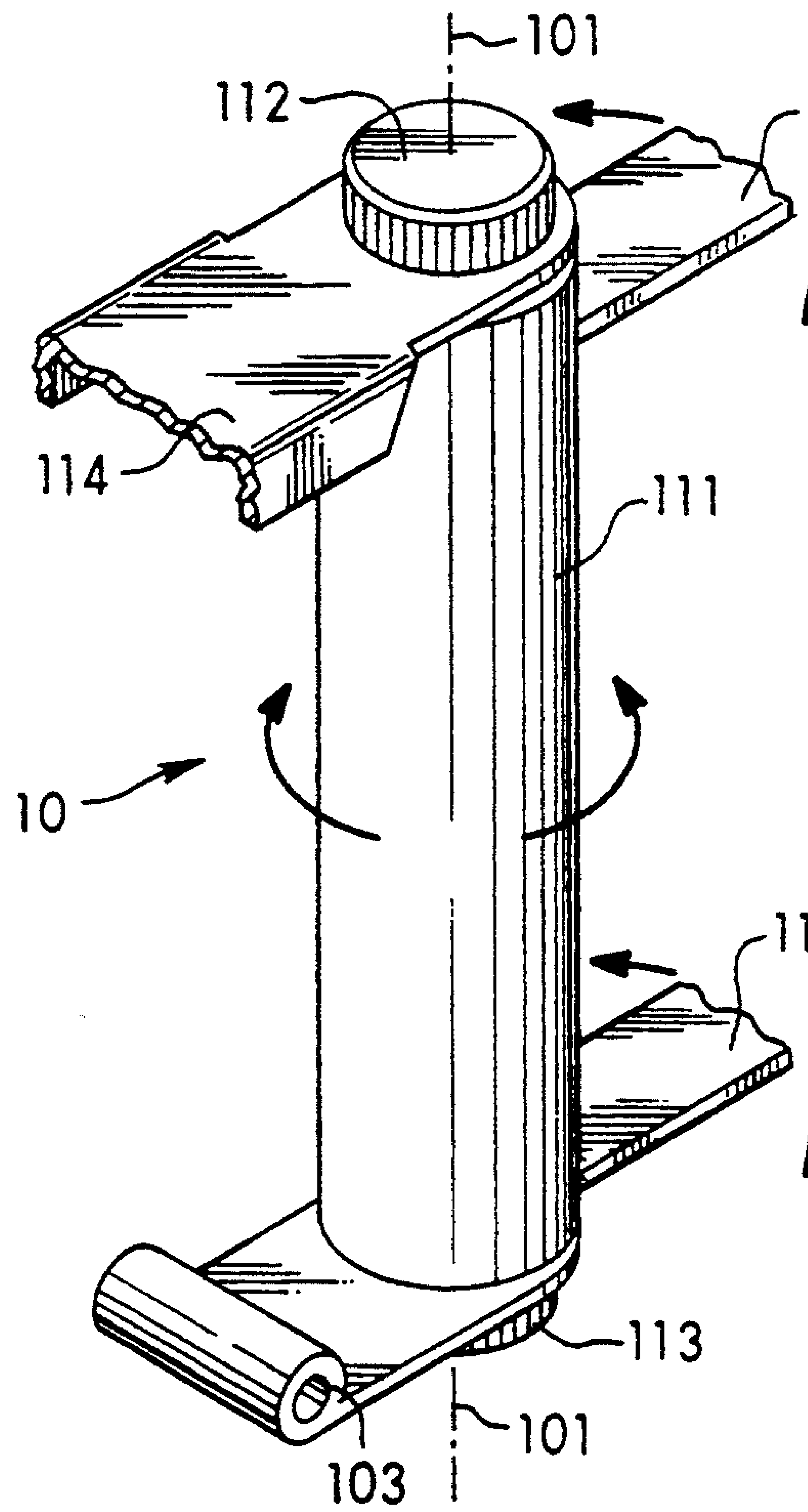
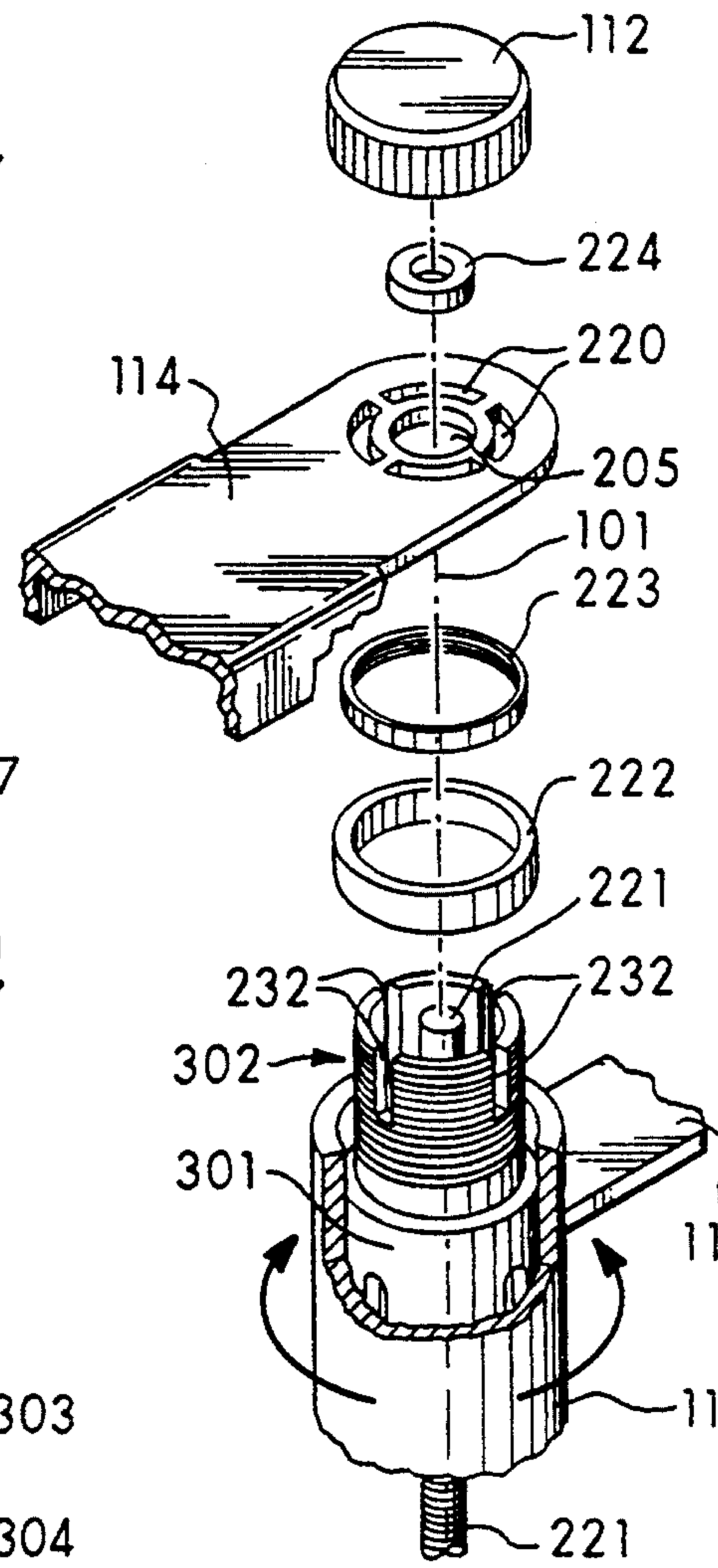


Fig. 2



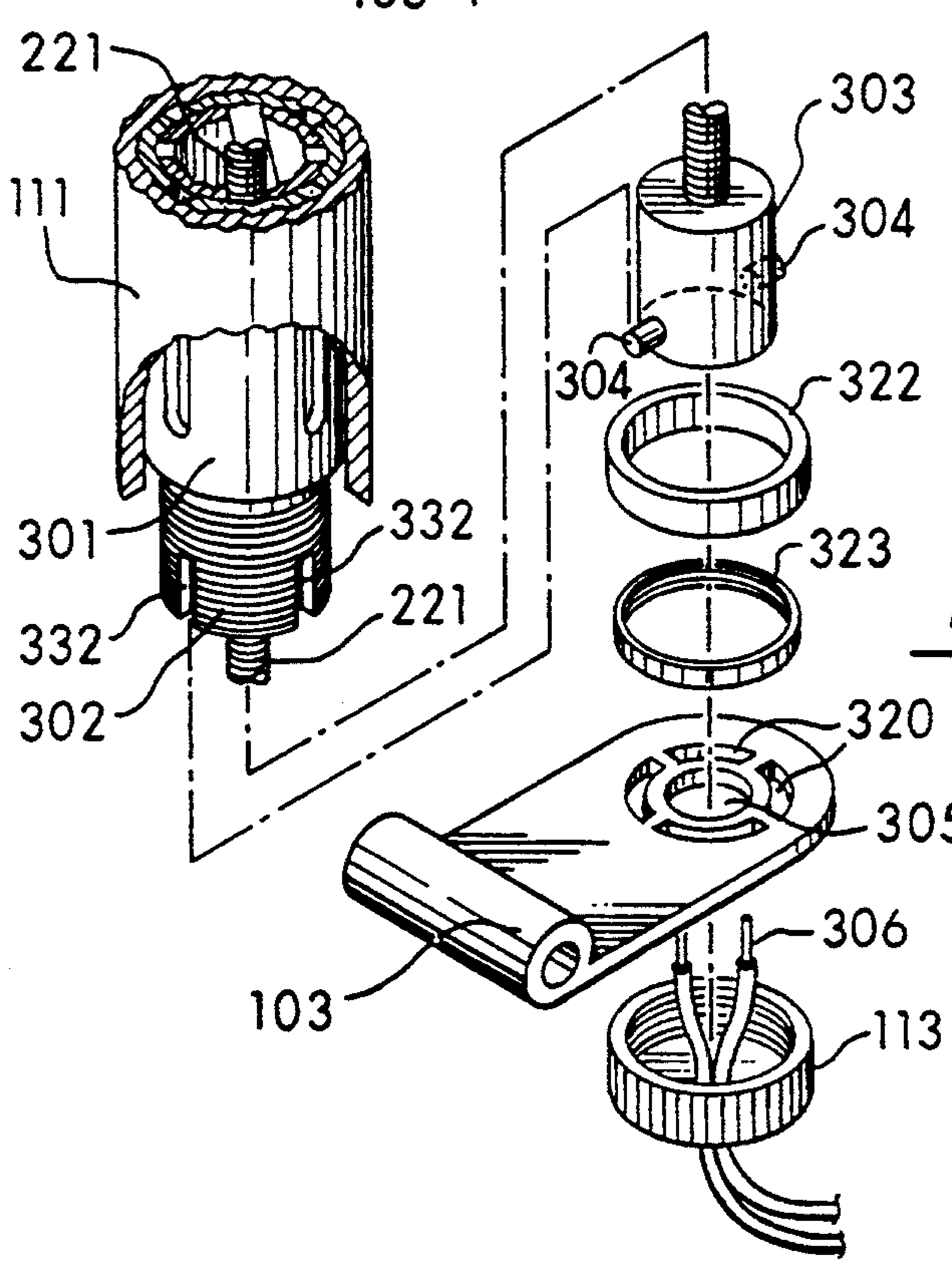


Fig. 3

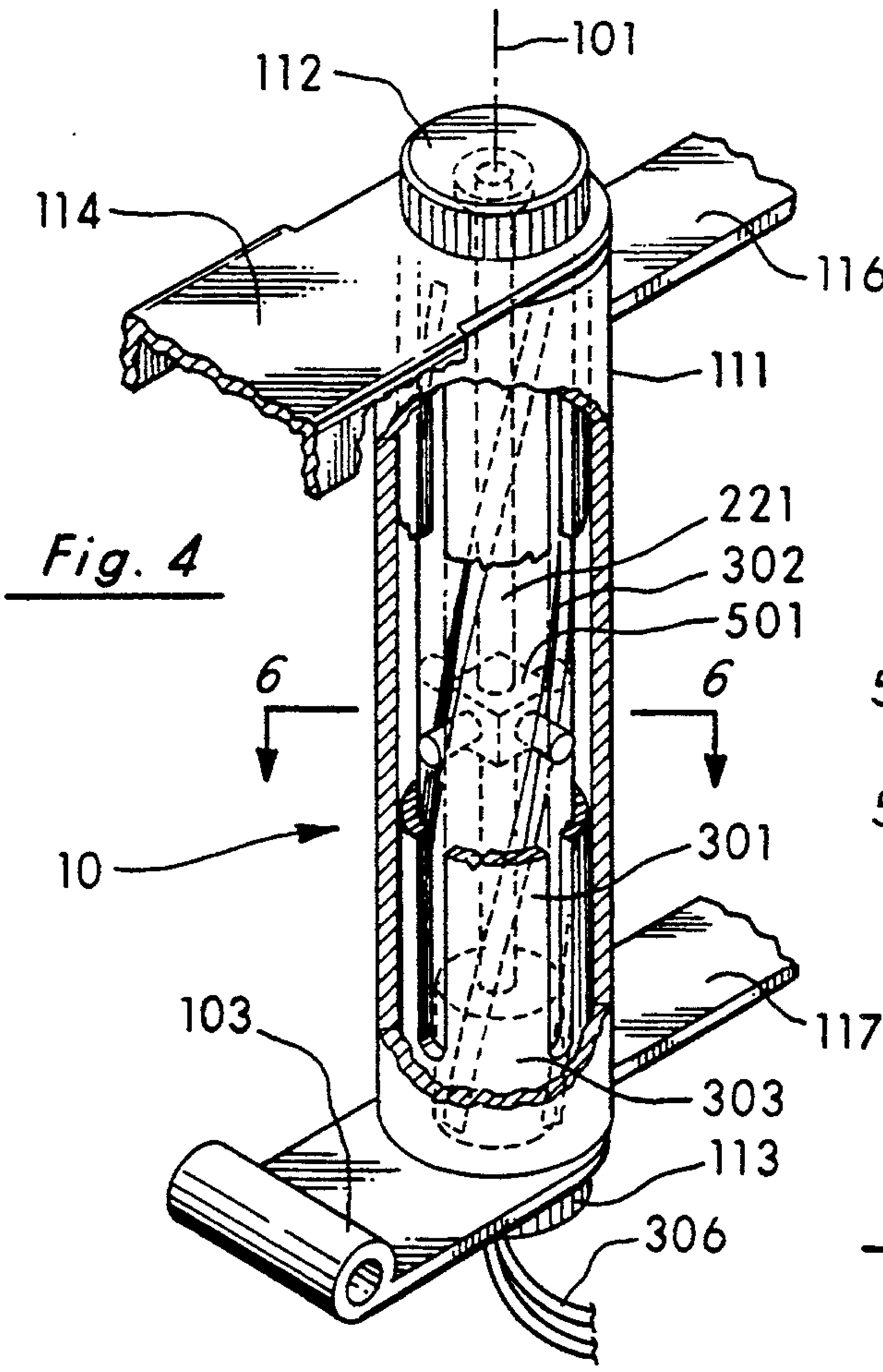


Fig. 4

Fig. 5

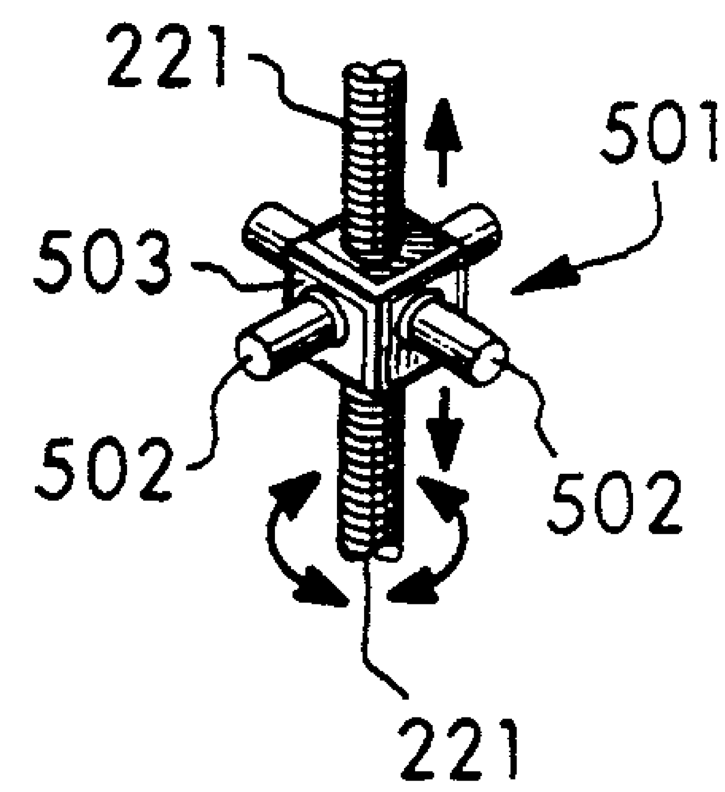


Fig. 8

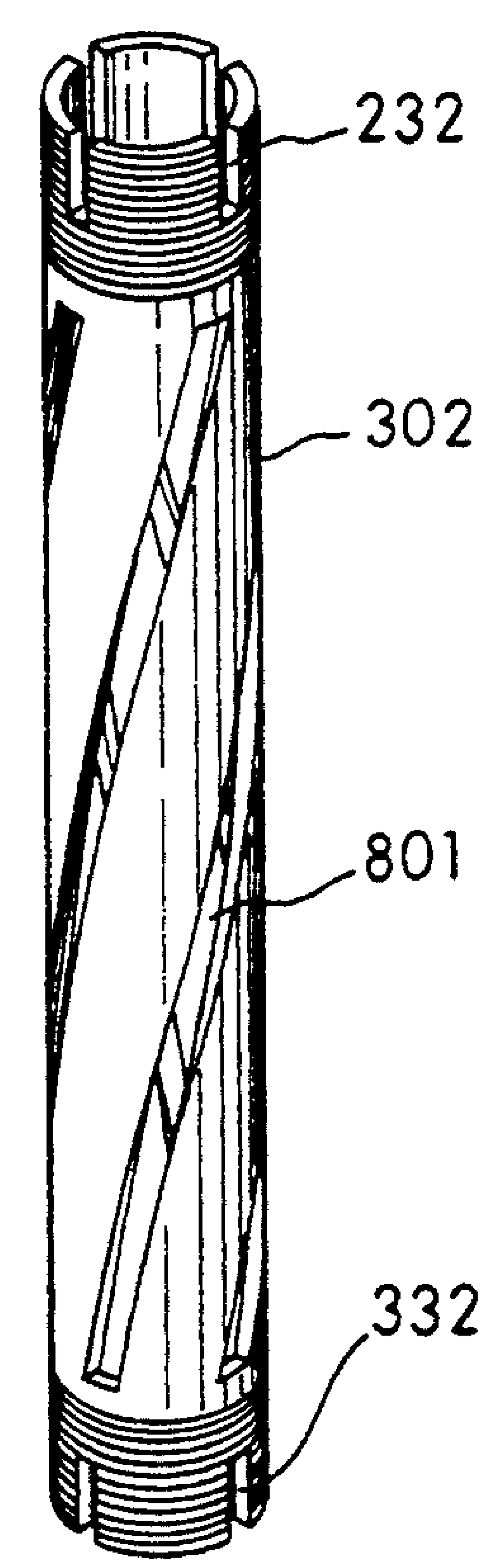
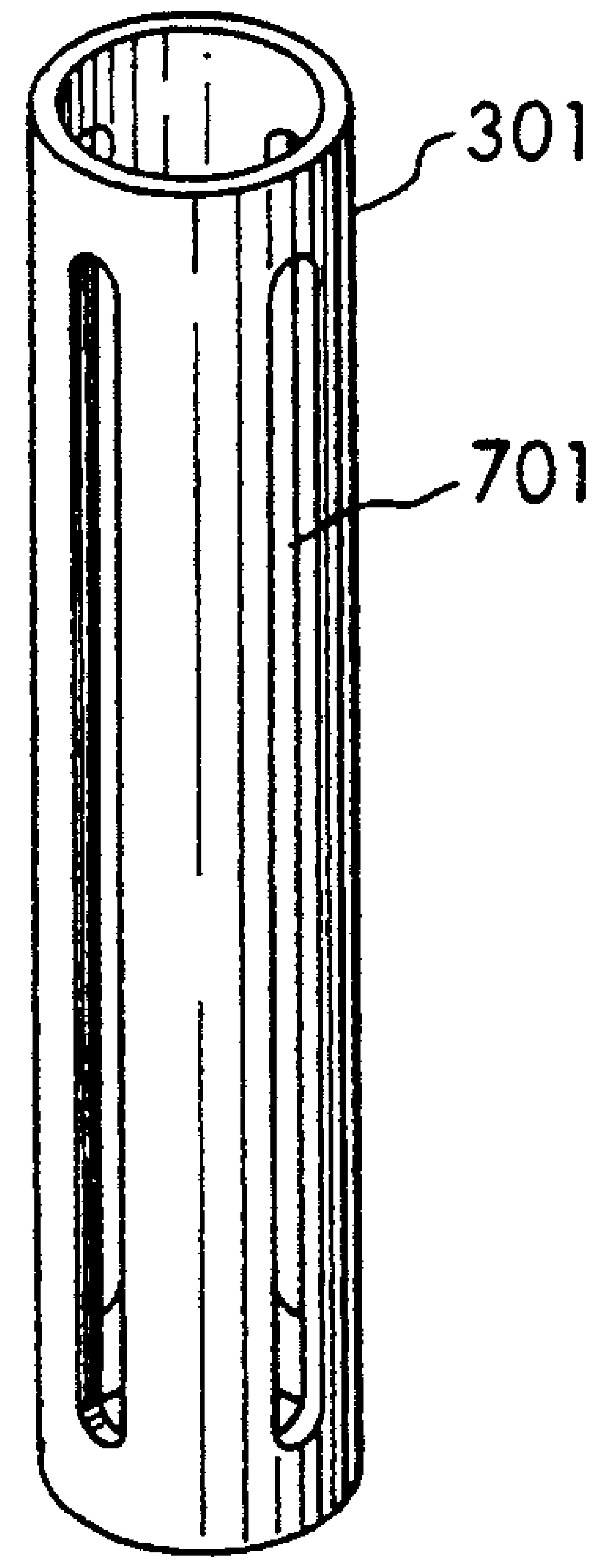


Fig. 7



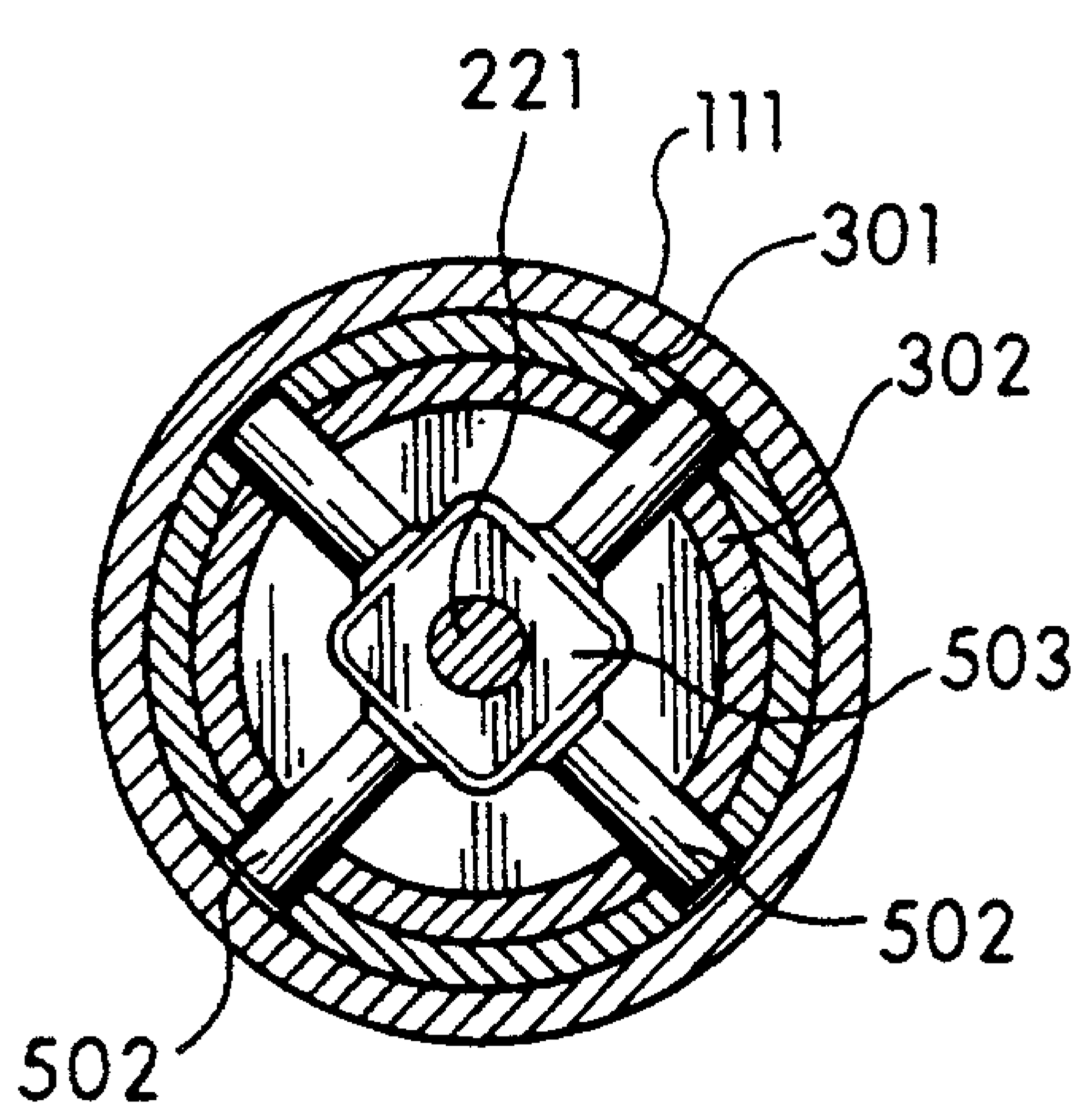


Fig. 6

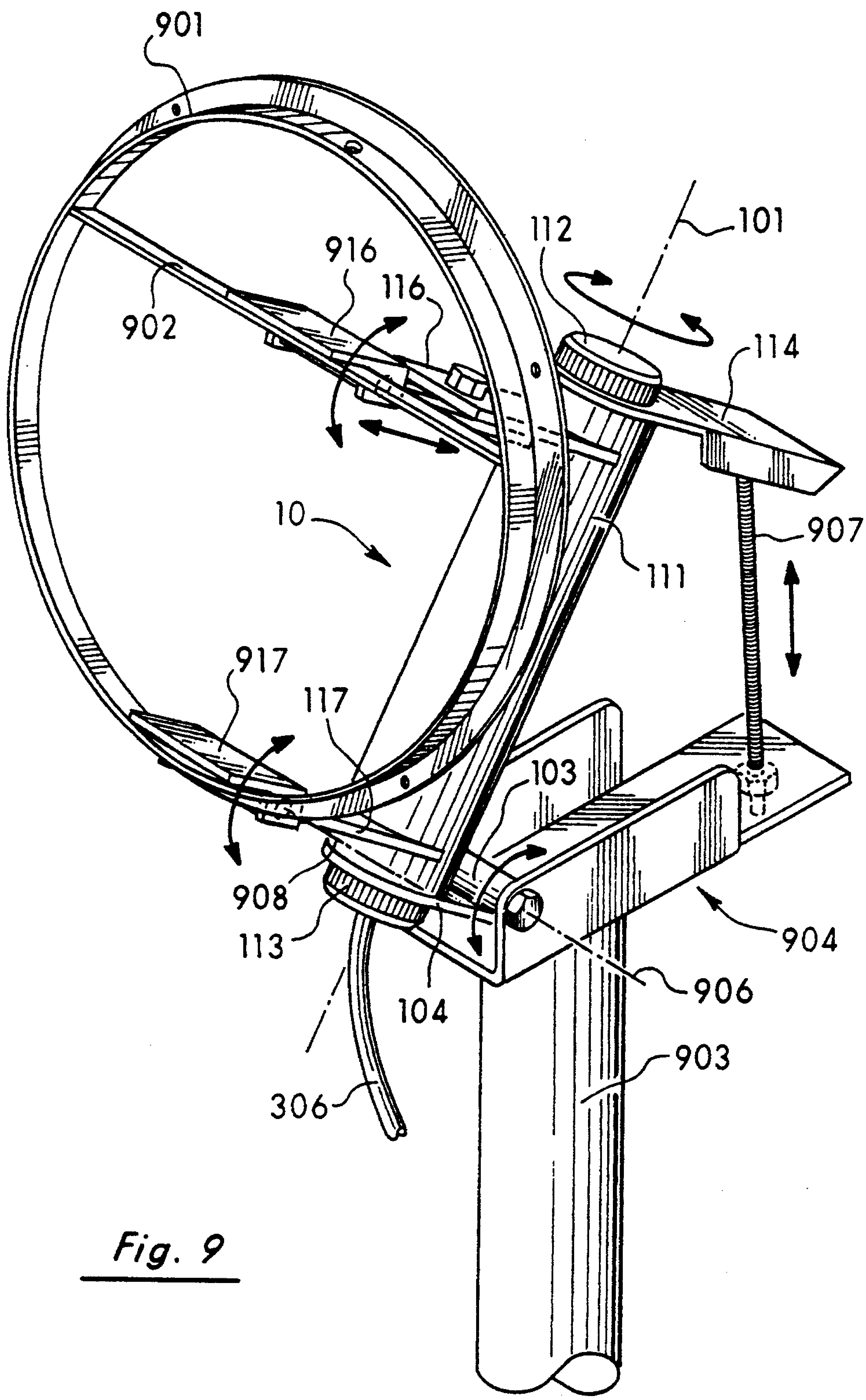

901
112
101
916
116
902
114
10
111
907
917
117
103
908
113
904
104
906
903
306

Fig. 9

HORIZON-TO-HORIZON TVRO ANTENNA MOUNT

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to antenna mounts and, in particular, the present invention relates to an antenna mount for attaching a TVRO antenna to a pipe mast anchored to the ground, the mount capable of aligning the antenna with any of several satellites positioned within a horizon-to-horizon view of the antenna.

STATEMENT OF THE PROBLEM

Satellite transmitted television is enjoying tremendous growth around the world. A satellite television system includes several geostationary satellites positioned in the Clark Belt around the earth that transmit microwave signals to a receiving antenna positioned on the ground. Usually the receiving antenna is a parabolic dish of substantial size to receive the relatively low power transmission from the satellite. Also, the receiving antenna must be aimed accurately at the transmitting satellite to receive the transmitted signal.

Each satellite transmits a different set of programming on a limited number of channels. At any given location on earth, several satellites are overhead, spaced from each other from horizon to horizon. Therefore, it is advantageous for a user to be able to reposition the receiving antenna to aim at any of the several satellites that are overhead a given position to access a greater amount and variety of programming.

Typically the antenna includes a positioning mechanism or actuator to provide for angular motion of an antenna structure with respect to a base structure to which the antenna is secured. The actuator must be a rugged mechanism to endure the mechanical stress caused by the weight of the antenna and effects of wind on the large surface area of the antenna. Also, the positioning mechanism must be accurate to provide reception of the transmitted signal.

Because satellite receiving antennae are located outdoors, the mount and actuator are exposed to the elements. Rain, snow and dirt degrade the positioning mechanism making it more difficult to move the antenna quickly and maintain an accurate position once a particular satellite is found. Moreover, the effects of weather age the antenna mount rapidly, increasing the effort required to maintain the antenna mount. This is particularly unacceptable when the antenna is located in a remote location where regular maintenance is difficult.

U.S. Pat. No. 4,126,865 issued to Longhurst et al. on Nov. 21, 1978 describes an antenna mount including an external motor that drives a crank that is coupled to the dish antenna by tie-rod arrangement. The crank and tie-rod arrangement are exposed to the elements. Also, the crank and tie-rod arrangement disclosed is suitable for slow tracking of a single satellite across the horizon, but cannot move the large satellite dish rapidly enough to provide rapid switching between several geostationary satellites.

U.S. Pat. No. 3,987,452 issued to Godet et al on Oct. 19, 1976 describes an antenna mount designed to move an antenna in three axes from horizon-to-horizon in any direction. This design is more complex than necessary as only single axis rotation is needed to access geostationary television satellites. The rotation mechanism used by Godet et al. uses a complex system of belts, pulleys, rollers, and multiple motors and joints to provide horizon-to-horizon coverage.

U.S. Pat. No. 4,663,635 issued to Wu on May 5, 1987 shows a mount for a dish antenna that uses a motor to drive the antenna via a worm-gear arrangement. Portions of the worm gear arrangement are exposed to the elements. U.S. Pat. No. 4,626,864 issued to Micklethwaite on Dec. 2, 1986 shows an antenna mount using motor-driven gears to move the antenna. In this design, both the motor and gears are protected by an external housing.

A need exists for an antenna mount that provides horizon-to-horizon positioning capability to maximize the number of satellites that can be accessed by the receiving antenna. Also, an antenna mount is needed that is rugged and protects the positioning mechanism from effects of weather to provide a long, low maintenance life span for the antenna.

SOLUTION TO THE PROBLEM

The present invention provides a solution to the stated problem by providing an antenna mount having a positioning mechanism with. only a few moving parts located inside a protective casing. The mounting assembly includes a casing having an outer surface attached to the antenna. A number of first guide slots positioned on the inner surface of the casing, either by forming them directly in the casing or in a separate tube that nests inside the casing.

An inner tube is located inside the casing, and has a diameter selected so that the casing can rotate freely with respect to the inner tube. The inner tube also has top and bottom portions extending outside the casing. A number of second guide slots are formed in the inner tube extending from the inner surface to the outer surface of the inner tube. One of either the first or second slots are nonlinear, preferably helical shaped. The top and bottom portions of the inner tube are attached to the mounting pole so that the inner tube cannot rotate with respect to the mounting pole.

The casing is rotated by a driving mechanism including a spider-like structure having a threaded central nut and several drive arms extending outward from the central nut. Each drive arm has a first end nested in the first guide slot, a body passing through the second guide slot, and a second end attached to the nut. A threaded leadscrew passes through the threaded central nut. One end of the leadscrew is attached to a reversible motor. The reversible motor is mounted to the inner tube.

As the motor turns the leadscrew, the spider-like structure moves up and down along the leadscrew. Because one of the first or second slots is helical, the vertical motion of the drive arm is translated into continuous rotational motion of the casing with respect to the inner tube.

SUMMARY OF THE INVENTION

Briefly stated, the present invention includes a mounting assembly for a TVRO antenna comprising a casing having an outer surface attached to the antenna and having an inner surface and at least one first guide slot positioned on the inner surface of the casing. An inner tube is located inside the casing, the inner tube having an inner surface, and having an outer surface freely rotatable within the inner surface of the casing. Portions of the inner tube extend out of the casing and are attached to the mounting pole. At least one second guide slot is formed in the inner tube extending from the inner surface to the outer surface of the inner tube. One of the first or second guide slots is nonlinear.

The casing is rotated by a drive arm having a first end nested i:n the first guide slot, a body passing through the second. guide slot, and a second end attached to a nut located in a central axis of the mounting assembly. A leadscrew passes through the nut and a motor coupled to one end of the leadscrew turns the leadscrew causing the nut and drive arm to move up and down which in turn causes the casing to rotate with respect to the inner tube.

DESCRIPTION OF THE DRAWING

FIG. 1 is perspective view of an assembled antenna mount in accordance with the present invention;

FIG. 2 is a partially exploded view of an upper portion of the antenna mount shown in FIG. 1;

FIG. 3 is a partially exploded view of a lower portion of the antenna mount shown in FIG. 1;

FIG. 4 is a cut-away view illustrating internal feature of the antenna mount shown in FIG. 1;

FIG. 5 is a detailed perspective view of a portion of a drive mechanism for the antenna mount in accordance with the present invention;

FIG. 6 shows a cross-section view of the antenna mount of FIG. 4;

FIG. 7 shows a perspective view of a portion of the antenna mount by the present invention;

FIG. 8 illustrates a perspective view of another inner portion of the antenna mount in accordance with the present invention; and

FIG. 9 illustrates a perspective view of the antenna mount of FIG. 1 attached to a dish antenna support.

SPECIFICATION

A. Overview

FIG. 1 illustrates a mounting assembly **10** in accordance with the present invention. Mounting assembly **10** includes a casing **111** that is attached to an upper dish mount **116** and a lower dish mount **117**. At the top of mounting assembly **10** is an upper mounting bracket **114**. At the bottom of mounting assembly **10** is a lower mounting bracket **104** which is a flat plate with a welded sleeve **103** formed thereon. Caps **112** and **113**, which are described in greater detail in reference to FIG. 2 and FIG. 3, seal against upper mounting bracket **114** and lower mounting bracket **104** to provide mechanical support for mounting brackets **114** and **104** as well as a weather resistant seal against the internal components (shown in FIG. 2–FIG. 8) of mounting assembly **10**. Unless otherwise specified, all components of mounting assembly **10** are preferably fabricated from steel, stainless steel, or other steel alloy. Depending on the demands and budget of a particular application, however, other materials are structurally suitable such as metals, plastics or composite materials.

Upper dish mount **116** and lower dish mount **117** are designed to mechanically couple to frame **901** and frame support **902** shown in FIG. 9. Therefore, upper dish mount **116** and lower dish mount **117** will vary in design depending on the particular structure of frame **901** and support **902**. Frame **901** is designed to attach to a dish antenna (not shown). Lower mounting bracket **104** is designed to mechanically couple to a headpiece **904** (FIG. 9) which is mounted on top of a mounting pole **903**.

Upper mounting bracket **114** attaches to rod **907** for stabilizing and supporting mounting assembly **10**, and for holding a central axis **101** of mounting assembly **10** in alignment with the Earth's rotational axis. Rod **907** is preferably threaded to allow easy adjustment of mounting assembly **10** to compensate for the geographic location of the antenna. Sleeve **103** allows mounting assembly **10** to be rotated or tipped about axis **906** running through a center of sleeve **103**, as suggested by bold arrows in FIG. 9. Mounting assembly **10** will tip about axis **906** as threaded rod **907** is adjusted.

In operation, a parabolic dish (not shown) is mounted on frame **901**. Frame **901** is attached to the outside of casing **111** via upper dish mount **116** and lower dish mount **117**. The mechanism inside casing **111**, described hereinafter, causes casing **111** to rotate, as suggested by arrows in FIG. 9, with respect to central axis **101**. Because upper mounting bracket **114** and lower mounting bracket **104** are attached to pole **903**, which is in turn embedded in the ground, the antenna scans the heavens from horizon-to-horizon as casing **111** rotates. In accordance with the present invention, the electrical and mechanical workings that drive rotation of casing **111** with respect to stationary mounting pole **903** are enclosed in casing **111**.

Power is supplied to the electrical components protected by casing **111** via power lines **306** which are visible in FIG. 9. Alternatively, non-electric driving force such as pneumatic or mechanical drivers inside or external to mounting assembly **10** may be used in which case power lines **306** are replaced by piping, cables, or the like.

In summary, mounting assembly **10** in accordance with the present invention includes a casing **111** that is driven to rotate about a central axis **101**. Upper and lower mounts **116** and **117** attached to casing **111** are for attaching to a dish antenna. Although the preferred embodiment is described in terms of a dish antenna, it should be understood that mounting assembly **10** could also be used to drive other types of antennae, or other devices that must aim at or track an object in the sky, such as a solar panel, low orbit satellites, incline satellites (non-stationary). Mounting assembly **10** includes an internal driving mechanism, described hereinafter, that is attached to a mounting pole via brackets **114** and **104** so that the internal driving mechanism does not rotate with respect to central axis **101**. In this manner, a rugged mounting assembly is provided that is capable of rotating an antenna about a single axis **101** while protecting the internal driving mechanism from the wearing and aging effects of weather.

B. Assembly Details of the Internal Drive Mechanism

The details of the drive mechanism positioned inside casing **111** are illustrated in FIG. 2 through FIG. 5. FIG. 2 shows a partially exploded view of an upper portion of mounting assembly **10**. Inside casing **111** are guide tube **301** and inner tube **302**. Guide tube **301** nests completely inside casing **111** and cannot rotate with respect to casing **111**. Inner tube **302** has an upper portion extending beyond the end of casing **111**. The upper portion of inner tube **302** is threaded and includes a number of mounting notches **232**. Inner tube **302** is sized to allow rotation of casing **111** and guide tube **301** with respect to inner tube **302**. In other words, the outside diameter of inner tube **302** is smaller than the inside diameter of casing **111** or guide tube **301**.

Inside inner tube **302** is a threaded leadscrew **221** that is aligned with central axis **101** and extends substantially to the top of inner tube **302**. Threaded leadscrew **221** has an end portion that extends into the threaded upper portion of inner tube **302**. The end portion of leadscrew **221** is desirably free of threads.

Cap **112**, which screws onto a threaded upper portion of inner tube **302**, conceals ring bearings **222** and **224** used to provide mechanical support to the internal drive mechanism. Upper guide ring bearing **222** has inside and outside diameters that are similar to those of guide tube **301**. Upper guide ring bearing **222** fits around inner tube **302** so that when upper guide ring bearing **222** is in place its upper surface is substantially flush with the upper surface of casing **111**, although precise alignment is not crucial. Preferably, upper guide ring bearing **222** comprises a roller bearing brass although other durable, machinable, low friction materials are known and are suitable.

Guide ring bearing **222** is held in place by retainer **223** which screws onto the threaded upper portion of inner tube **302**. Retainer **223** preferably comprises steel or stainless steel, although other suitable materials will be apparent to skilled machinists. It is important that retainer **223** and guide bearing **222** slidably engage each other to allow free rotation of casing **111** and guide tube **301** with respect to inner tube **302**.

Upper mounting bracket **114** is provided with a number of arc-shaped mounting slots **220** concentrically positioned about central axis **101**. Mounting slots **220** are sized and positioned to mate with notches **232** in the threaded upper portion of inner tube **302**. A hole **205** in the center of mounting slots **220** in mounting bracket **114** is sized to securely hold top bearing **224**. Top bearing **224** comprises brass in the preferred embodiment, but may also comprise other well known durable, low friction materials. The inside diameter of top bearing **224** is sized to fit onto the unthreaded end portion of leadscrew **221**, thereby holding leadscrew **221** in alignment with central axis **101**.

An exploded view of a lower portion of the mounting assembly **10** in accordance with the present invention is illustrated in FIG. **3**. Many elements shown in FIG. **3** are analogous to elements shown in FIG. **2**, allowing for reduced parts inventories for the manufacturer and lower manufacturing cost. A lower threaded portion of inner tube **302** extends beyond casing **111** and includes lower mounting notches **332** that are similar to upper mounting notches **232** described in reference to FIG. **2**. Threaded leadscrew **221** extends through the length of inner tube **302** and has an end attached to motor **303**.

Motor **303** is a reversible motor, preferably a DC motor for turning leadscrew **221** in a clockwise and counterclockwise direction. Alternatively, motor **303** may be replaced by a pneumatic or mechanical driving mechanism. Motor **303** may be a stepping motor to accurately control the position of the antenna, but need not be. Motor **303** desirably includes some form of position feedback mechanism (not shown) which may be optoelectronic or Hall effect sensors, or the like. This type of position feedback is well known and easily adapted to the mounting assembly in accordance with the present invention to provide accurate positioning control.

Motor tabs **304** are used for mounting motor **303** in lower mounting notches **332** in inner tube **302**. It is important that motor **302** does not rotate with respect to inner tube **302**, and motor tabs **304** are one way of mounting motor **303** to inner tube **302** that prevents rotation. Motor tabs **304** preferably are not longer than the thickness of the sidewall of inner tube **302** so that they do not extend beyond the outer surface of inner tube **302** when motor **303** is in position. Other suitable mounting means include friction mounting, or retaining screws through the sidewall of inner tube **302** to motor **303**.

Lower guide tube ring bearing **322** and retaining ring **323** perform the same function in a similar manner as upper guide tube ring bearing **222** and retaining ring **223** described in reference to FIG. **2**. Lower mounting bracket **104** includes a number of arcuate mounting slots **320** that are designed to mate with mounting notches **332** in the threaded bottom portion of inner tube **302**. A hole **305** in the center of mounting slots **320** allows power lines **306** to pass through lower bracket **104** to motor **303**. Power lines **306** also pass through a hole (not visible) in lower cap **113** to a power source (not shown). Other wires (not shown) for providing control or feedback information to the internal drive mechanism could also pass through lower cap **113** and hole **305** if desired.

FIG. **4** illustrates a cut-away view of mounting assembly **10** in accordance with the present invention in a manner that indicates the cooperation among the elements of the internal drive mechanism described above. Casing **111**, guide tube **301**, inner tube **302** and leadscrew **221** are all coaxially aligned with central axis **101**. Guide tube **301** and inner tube **302** include features described in greater detail hereinafter. Also, a spider-like assembly **501** is mounted on leadscrew **221**, and is described in detail in reference to FIG. **5**.

In summary, guide tube **301** and casing **111**, which do not rotate with respect to each other, are positioned around inner tube **302** so that casing **111** can rotate with respect to inner tube **302**. Ring bearings **222** and **322** are held by retainers **223** and **323** to maintain alignment of casing **111**, guide tube **301** and inner tube **302**. Threaded leadscrew **221** is aligned with central axis **101** and passes through the center of inner tube **302**. Upper and lower mounting brackets **114** and **104** include mounting slots **220** and **320** that mate with notches in the upper and lower portions of inner tube **302** to securely attach mounting brackets **114** and **104** to inner tube **302**. Mounting bracket **114**, which is mechanically coupled to a mounting pole **903** (FIG. **9**) in use, holds mounting assembly **10** in place while casing **111** can be driven to rotate about central axis **101**. Caps **112** and **113** screw onto the threaded upper and lower portions of inner tube **302** and seal against mounting brackets **114** and **104** to protect the internal drive mechanism from the elements.

C. Component Details of the Internal Drive Mechanism

FIG. **5** through FIG. **8** illustrate details of important component parts of the internal drive mechanism housed inside casing **111**. As shown in FIG. **5**, spider-like apparatus **501** is positioned on leadscrew **221** inside inner tube **302** (shown in FIG. **2** through FIG. **4**). Spider-like apparatus **501** includes a threaded nut **503** that fits onto threaded leadscrew **221**. Nut **503** moves up and down, as suggested by vertical arrows in FIG. **5**, as leadscrew **221** is turned, as suggested by curved arrows in FIG. **5**. Nut **503** is preferably cube-shaped, but other shapes are suitable. At least one drive arm **502** extends away from nut **503**. As shown in FIG. **5**, one drive arm **502** extends perpendicularly away from each of the four side walls of cube-shaped nut **503**. Nut **503** and drive arms **502** comprise steel or a similar, durable metal alloy, although other durable, machinable material including plastics, ceramics, ant the like in the preferred embodiment.

As seen in the cross-section view of FIG. 6, drive arms **502** extend through a first set of guide slots **801** (FIG. 8) formed in inner tube **302**. An end of each drive arm **502** fits into a second set of guide slots **701** (FIG. 7) formed in guide tube **301**. At this point it should be noted that the primary function of guide tube **301** is to provide the second set of guide slots **701** such that the second set of guide slots **701** cannot rotate with respect to casing **111**. Alternatively, second guide slots **701** can be formed integrally with casing **111** by creating grooves extending partially through the sidewall of casing **111**. Forming grooves partially through a tube sidewall is a difficult machining task, however, and so it is recommended. that guide tube **301** and casing **111** be formed as separate components as illustrated in FIG. **6** and FIG. **7**.

As shown in FIG. **7**, guide tube **301** is preferably a hollow cylinder-shaped tube with a circular cross-section. Second guide slots **701** formed through the sidewall of guide tub **301** are desirably substantially linear slots extending vertically along the length of guide tube **301**. A guide slot **701** is provided for each drive arm **502** (FIG. **6**). Also, each second guide slot **701** is sized so that an end of a drive arm **502** fits into guide slot **701** with minimal clearance to prevent lateral play, while allowing drive arms **502** to move vertically with little friction. Optionally, the end of each drive arm **502** can be oval of elliptical to act as a cam when inserted into guide slot **701** and rotated during assembly to provide a snug yet low friction coupling between guide slot **701** and drive arms **502**.

FIG. **8** illustrates details of inner tube **302**, which is preferably a hollow cylinder-shaped tube with a circular cross-section. The diameter of inner tube **302** is selected to allow inner tube **302** to rotate freely inside guide tube **301**. Upper and lower portions of inner tube **302** are threaded. The length of inner tube **302** is selected to allow both the upper and lower portions to extend beyond guide tube **301** and casing **111**, as shown in FIG. **2** and FIG. **3**. Upper mounting notches **232** are formed in the upper threaded portion of inner tube **302**, while lower mounting notches **332** are formed in the lower threaded portion of inner tube **302**.

First guide slots **801** formed through the sidewall of inner tube **302** are desirably nonlinear slots extending along the length of inner tube **302**. First guide slots **801** are preferably helically shaped and are formed with a continuous curve. Desirably, an end of each guide slot **801** near upper mounting notches **232** is on an opposite side, or 180 degrees from, another end of the first guide slot **801** near lower mounting notches **332**. This arrangement allows the dish antenna (not shown) to be rotated through 180 degrees or from horizon-to-horizon.

One first guide slot **801** is provided for each drive arm **502** (FIG. **6**). Also, each first guide slot **801** is sized so that the body of a drive arm **502** passed through the first guide slot **801** with minimal clearance to prevent lateral play, while allowing drive arms **502** to move vertically with little friction.

In summary, spider-like apparatus is designed to move vertically when leadscrew **221** is rotated, forcing drive arms **502** up and down. Drive arms **502** pass through a first set of guide slots **801** formed in inner tube **302** and a second set of guide slots **701** formed in guide tube **301**. Although the second set of guide slots **701** is best formed as a separated component from casing **111**, they may be formed as an integral unit. As illustrated in FIG. **7** and FIG. **8**, first guide slots **801** are helically shaped whereas second guide slots **701** are linear. Alternatively, first guide slots **801** may be linear and second guide slots **701** be nonlinear or helical, or both may be non-linear with differing curves with respect to each other. So long as one of guide slots **701** and **801** are not the same shape, the vertical motion of drive arms **502** will be translated into rotational motion of casing **111** about central axis **101**.

D. Operation of the Mounting Assembly

FIG. **1**, FIG. **4**, and FIG. **9** viewed together illustrate the operation of horizon-to-horizon mounting assembly **10** in accordance with the present invention. Referring specifically to FIG. **9**, pole **903** is fixed in the earth or a heavy concrete base to prevent its moving when the antenna is repositioned. Lower mounting bracket **104** is rigidly attached to pole **903** via headpiece **904**. Because lower mounting bracket **104** is attached to inner tube **302**, shown in FIG. **4**, inner tube **302** cannot rotate with respect to pole **903**.

To reposition the antenna (not shown) attached to frame **901** in FIG. **9**, motor **303** is activated by applying power to power lines **306**. Motor **303** causes leadscrew **211** to turn, moving nut **503** and drive arms **502** upward or downward. Because first guide slots **801** are curved, and second guide slots **801** are linear, drive arms **502**, which extend through both first and second guide slots **801** and **701**, force second guide slots **701** to turn or rotate as drove arms **502** move vertically.

Second guide slots **701**, whether formed separately in guide tube **301** or integrally with casing **111**, move together with casing **111** so that casing **111** rotates with respect to inner tube **302** when drive arm **502** moves up or down vertically. The antenna (not shown) is rigidly attached to casing **111** via frame **901** and brackets **916** and **917** in FIG. **9**. Brackets **916** and **917** attach to dish mounts **116** and **117** so as to allow declination adjustment of the dish antenna about dish axis **908**. Hence, when casing **111** rotates with respect to central axis **101** the antenna (not shown) rotates about central axis **101**. Because the curve of the first guide slots can extend 180 degrees or more, as shown in FIG. **8**, the antenna can be repositioned to aim at any satellite visible to the antenna from horizon-to-horizon.

E. Conclusion

By now it is apparent that an antenna mount which is very rugged and weather resistant is provided. The antenna mount in accordance with the present invention is suitable for moving dish antenna structures, yet is so compact that the entire drive mechanism is placed within a casing and sealed against weather damage. The TVRO antenna mount of the present invention is particularly suitable for remote locations where maintenance costs are high, and yet is structurally simple enough that is a cost-effective antenna mount for domestic satellite television reception.

It is to be expressly understood that the claimed invention is not to be limited to the description of the preferred embodiment but encompasses other modifications and alterations within the scope and spirit of the inventive concept. For example, the mount in accordance with the present invention can be used to position photovoltaic equipment rather than a dish antenna. Also, the single axis antenna mount in accordance with the present invention can be used alone or in combination with mechanics for provide other axes of rotation. Different materials including plastics, composites, and combinations of metal, plastic and composite material can be used to construct the elements of the antenna mount. Moreover, the casing **111** can be attached to a mounting pole while the inner tube **302** can be attached to a TVRO antenna, while the mechanism of the present invention operates in a manner substantially similar to the preferred embodiment described above. Accordingly, these and other like modifications of the described antenna mount are within the spirit and claims of the present invention.

I claim:

1. A mounting assembly for attaching a dish antenna to a mounting pole, the mounting assembly comprising:

a cylindrically shaped inner tube having an upper end and a lower end adapted for rigidly attaching the inner tube to the mounting pole, and having a sidewall having an inside surface and an outside surface;

a first guide slot formed in the sidewall of the inner tube extending from the inner surface to the outer surface;

a motor positioned inside the inner tube and aligned with the inner tube, the motor being rigidly mounted to the bottom portion of the inner tube;

a threaded leadscrew inside the inner tube and aligned with a central axis of the inner tube, the threaded leadscrew having one end attached to the motor and extending to the top portion of the inner tube;

a nut mounted on the threaded leadscrew, wherein the nut moves up and down along the length of the leadscrew when the leadscrew is rotated by the motor;

a cylindrically shaped guide tube, and having a sidewall having an inside surface and an outside surface, wherein the guide tube positioned coaxially with the inner tube and free to rotate about the inner tube;

a second guide slot formed through the sidewall along the length of the guide tube, wherein the first and second guide slots are not the same shape;

at least one drive arm affixed to the nut and extending away from the leadscrew through the first guide slot and into the second guide slot;

a cylindrically shaped casing surrounding the guide tube and attached to the guide tube in a manner to prevent rotation of the casing with respect to the guide tube; and

a means attached to the casing for attaching the casing to an antenna.

2. The mounting assembly for attaching a dish antenna to a mounting pole of claim **1** further comprising:

a set of upper notches formed in the upper end of the inner tube;

a set of lower notches formed in the lower end of the inner tube;

an upper bracket having a first end and second end having a plurality of mounting slots positioned and sized to allow mounting of the second end of the upper bracket on the upper notches; and

a lower bracket having a portion for attaching to a headpiece of a mounting pole and one end having a plurality of mounting slots positioned and sized to allow mounting of the lower bracket on the lower notches.

3. The mounting assembly for attaching a dish antenna to a mounting pole of claim **2** wherein the upper and lower ends of the inner tube are threaded, and the mounting assembly further comprises: an upper threaded cap that screws onto the upper end of the inner tube; a lower threaded cap that screws onto the lower end of the inner tube, wherein the upper cap seals against the second end of the upper bracket and the lower cap seals against the end of the lower bracket.

4. The mounting assembly for attaching a dish antenna to a mounting pole of claim **1** wherein the first guide slot is helically shaped and the second guide slot is substantially linear.

5. The mounting assembly for attaching a dish antenna to a mounting pole of claim **1** wherein the first guide slot is substantially linear and the second guide slot is helically shaped.

6. A mounting assembly for attaching a dish antenna to a mounting pole, the mounting assembly comprising:

a threaded leadscrew positioned in a central axis of the mounting assembly;

an inner tube having a sidewall, an upper portion, and a lower portion, the inner tube positioned coaxially with the leadscrew;

a number of helically shaped slots formed through the sidewall of the inner tube;

a motor mounted inside the lower portion of the inner tube attached to one end of the leadscrew for rotating the leadscrew in a clockwise and counterclockwise direction about the central axis;

a nut mounted on the threaded leadscrew wherein the nut moves up and down along the length of the leadscrew when the leadscrew is rotated;

a number of drive arms affixed to the nut and extending away from the leadscrew, wherein each of the number of drive arms passes through one of the number of helically shaped slots and has an end portion that extends beyond the sidewall of the inner tube;

a cylindrically shaped casing surrounding the inner tube and having a length selected so that the upper portion and lower portion of the inner tube extend beyond the casing;

slot means for guiding the at least one drive arm, wherein the end portion of the at least one drive arm fits into the slot means and the slot means cannot rotate with respect to the casing;

a first means connected to the upper and lower portions of the inner tube for attaching the mounting assembly to the mounting pole; and

a second means connected to the casing for attaching the casing to an antenna.

7. The mounting assembly of claim **6** wherein the slot means for guiding comprise a number of linear slots extending vertically along an inside surface of the casing, wherein the end portion of each of the number of drive arms fits into one of the linear slots.

8. The mounting assembly of claim **7** wherein the slot means for guiding comprises a guide tube having a larger inside diameter than an outside diameter of the inner tube and nested inside the casing to prevent rotation of the guide tube with respect to the casing, wherein the guide tube includes a number of linear slots extending vertically along a sidewall of the guide tube, wherein the end portion each of the number of drive arms fits into a linear slot in the guide tube.

9. The mounting assembly of claim **6** wherein the upper portion and the lower portion of the inner tube include a number of notches aligned with the central axis, and the first means for attaching further includes a mounting bracket having a predetermined pattern of mounting slots formed therein, the mounting slots designed to mate with the notches.

10. The mounting assembly of claim 9 wherein the upper portion and the lower portion of the inner tube are threaded, and the means for attaching further includes a first and a second threaded caps sized to screw onto the upper and lower portions of the first cylinder for rigidly attaching the mounting bracket to the inner tube.

11. The mounting assembly of claim 6 wherein the nut is cube-shaped and includes a threaded hole passing from a lower face to an upper face for mounting the nut to the threaded leadscrew, and the mounting assembly further included four drive arms extending away from each side face of the cube-shaped nut.

12. The mounting assembly of claim 6 wherein the motor is a direct current reversible motor.

13. The mounting assembly of claim 6 wherein the motor, leadscrew, nut, drive arms, inner tube and slot means for guiding are positioned inside the casing.

14. A mounting assembly for attaching an antenna to a mounting pole, the mounting assembly comprising:

a tube-shaped casing having an outer surface rigidly attached to the antenna and having an inner surface, wherein the tube-shaped casing includes a plurality of guide slots affixed to the inner surface;

an inner cylinder having a plurality of curved slots formed in therein, each slot extending from near the top portion to near the bottom portion of the inner cylinder, the inner cylinder mounted inside the tube-shaped casing to allow rotation of the casing vis-a-vis the inner cylinder, the inner cylinder having top and bottom portions extending outside of the tube-shaped casing;

means connected to the inner cylinder and engaging the guide slots affixed to the inner surface of the tube-shaped casing for causing the tube-shaped casing to rotate with respect to the inner cylinder; and

means for attaching the mounting pole to the top and bottom portions of the tube-shaped inner cylinder.

15. The mounting assembly of claim 14 further comprising a means connected to the top and bottom portions of the inner cylinder for sealing the inner cylinder.

16. The mounting assembly of claim 15 wherein the means for sealing also seals the tube-shaped casing.

17. A mounting assembly for attaching an antenna to a mounting pole, the mounting assembly comprising:

a tube-shaped casing having an outer surface rigidly attached to the antenna and having an inner surface;

guide slots affixed to the inner surface of the casing;

an inner cylinder having a plurality of curved slots formed in therein, each slot extending from near the top portion to near the bottom portion of the inner cylinder, the inner cylinder mounted inside the tube-shaped casing to allow rotation of the casing vis-a-vis the inner cylinder, the inner cylinder having top and bottom portions extending outside of the tube-shaped casing;

means for attaching the mounting pole to the top and bottom portions of the inner cylinder;

means connected to the tube-shaped casing for causing the tube-shaped casing to rotate with respect to the inner cylinder, wherein the means for causing the tube-shaped inner cylinder to rotate further comprises:

a threaded leadscrew positioned in a central axis of the mounting assembly;

a motor positioned inside the inner cylinder and connected to the threaded leadscrew for turning the leadscrew; and

a spider-shaped nut threaded onto the threaded leadscrew and having a plurality of arms extending perpendicularly away from the central axis, wherein each of the arms of the spider-shaped nut extend through one of the curved slots in the inner cylinder to engage the guide slots affixed to the inner surface of the casing.

18. The mounting assembly of claim 17 wherein the plurality of guide slots are positioned vertically on an inside surface of the tube-shaped casing, wherein each of the arms extends into one of the guide slots, and the guide slots serve to prevent rotation of the spider-shaped nut with respect to the tube-shaped casing when the leadscrew is rotated.

19. The mounting assembly of claim 17 wherein each of the curved slots formed in the casing are helically shaped and a portion of the slot moves at the top end of the casing is approximately 180 degrees from a portion of the slot at the bottom end of the casing.

20. A mounting assembly for attaching an antennae to a mounting pole, the mounting assembly comprising:

a casing having an outer surface attached to the antenna and having an inner surface;

at least one first guide slot positioned on the inner surface of the casing;

a inner tube located inside the casing, the tube having an inner surface, and having an outer surface, wherein the inner tube is free to rotate with respect to the casing and the inner tube includes top and bottom portions extending outside of the casing;

at least one second guide slot extending from the inner surface to the outer surface of the inner tube, wherein the first and second guide slots are not the same shape;

a drive arm having a first end nested in the first guide slot, a body passing through the second guide slot, and a second end near a central axis of the mounting assembly;

motorized means mechanically coupled to the drive arm for causing the drive arm to move vertically between the upper end and the lower end of the inner tube, thereby causing rotation of the casing with respect to the inner tube; and

means coupled to the mounting pole and the top and bottom portions of the inner tube for attaching the mounting pole to the top and bottom portions of the inner tube.

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